Monitoring Strategy for Streams & Rivers

- The nutrient monitoring program measures
  - standard water chemistry parameters
  - two forms of algal biomass
    - chlorophyll *a* and ash free dry mass (AFDM)
- Rotating basin sampling design
  - conducted at probabilistic sampling sites
    - 34- 38 sites/basin (9 basins)
- Sample sites visited three times each field season
  - spring, summer, fall
- Algal biomass collected from both seston and periphyton
  - particulate organic carbon (POC) used as an alternative measurement of biomass for seston.

General Format of Criteria

- **First choice**
  - **Establish some type of cause and effect relationship between nutrient parameter(s) and biological condition (rivers and streams) or use support (lakes)**
- **Alternatives**
  - **Establish some type of reference condition to set criteria**
  - **Use percentile approach similar to that used by EPA**

Results of Recent Data Collection & Analysis Efforts

- Rivers and Streams (2001-2005; USGS)
  - **Algal biomass: nutrients**
    - **No correlation with periphyton chl *a***
    - **Seston: TKN, no TP correlation**
    - **Seston chl *a*: POC**
    - **Periphyton chl *a*: AFDM**
  - **Algal biomass: nutrients: biological communities**
    - **On-going**

- **Lakes and Reservoirs (1989-2005; Limo-Tech, Inc.,)**
  - Data from 507 lakes
  - Variables analyzed
    - lake type
    - ecoregion
    - physical parameters chlorophyll *a*
    - Secchi depth
    - TN, TP
    - land use

- **Preliminary Results**
  - Lake type significant, ecoregion not significant
  - Multiple Regression Analysis and Regression Tree Analyses
    - preliminary TP thresholds established for natural lakes and reservoirs using chlorophyll *a* as the response variables

- **Next steps (Tetra-Tech)**
  - Determine if further analyses (such as bootstrapping) would provide a more accurate refinement of TP and chlorophyll *a* thresholds.
  - Consider whether multiple eco-regions and further division of lake types is warranted.
  - Re-evaluate the data to determine if a positive correlation exists between TP and Secchi depth.

Tentative Timeline for Lakes' Criteria Rulemaking

May 2008	IDEM completes development of proposed criteria for lakes and reservoirs
June - July 2008	Begin organizing Stakeholder Workgroup meetings
Aug. – Dec. 2008	Stakeholder Workgroup meetings held. IDEM revises proposal, as appropriate
Jan. - April 2009	3 public hearings held across state
May 2009	Administrative rules presented to Indiana's Water Pollution Control Board for approval

Progress of Criteria Development

Year	Task	Status
2001-2005 (1st 5 year cycle)	Probabilistic sampling on all river basins (USGS)	Completed
2006 (start of 2nd 5 year cycle)	Probabilistic sampling on Upper White, Lower White, Eel and Patoka river basins (IDEM)	Completed
2006-2007	Rivers/streams data collection (IDEM)	Completed
2007	Lakes data analysis (Limno-Tech, Inc.)	Completed January 2007

Anticipated Schedule for Implementing Nutrient Criteria

Year	Task	Status
2008	Review data; propose draft criteria for streams & lakes	To be completed by spring 2008
2008	Agree on proposed criteria; review draft rule language	To be completed by summer/fall 2008
2009	Agree on proposed rule language; review draft of implementation procedures	Planned for spring 2009
2009	Agree on proposed implementation procedures; prepare proposed rule making package	Planned for summer 2009
2009	Begin rule making process	Planned for winter 2009